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CLAYS FOR SAGGERS

Saggers are used to protect pottery, tile, abrasive wheels, and other ceramic products from furnace gases, ashes, and rapid fluctuations in temperature.

They are box-like containers, made as a rule from second- or third-quality fire clay. The saggers, before being used, are heated at a temperature approximating that at which ceramic ware subsequently placed within them is heated. Such preliminary heating develops the strength necessary for handling them and for carrying the loads to which they may be subjected. They are built strong enough to permit their being stacked upon one another to considerable heights, thereby decreasing the cost of maturing the ware in any individual unit.

Although the average purchaser of clay ware never sees a sagger or realizes its significance, yet he or she must bear its cost when purchasing pottery or other ceramic ware. The loss encountered annually from breakage of saggers and resulting spoiled ware amounts to several millions of dollars. The Bureau has been studying saggers and sagger clays for several years with a view to reducing that loss. It has studied the properties of approximately 50 sagger clays as well as saggers made from those clays. A report which will be published in the Journal of the American Ceramic Society gives the results of tests recently made on a series of sagger bodies together with a chart which it is believed will permit the manufacturer of saggers to predict with a reasonable degree of accuracy the relative length of service which may be expected from saggers made from combinations of clays of which some of the properties have been measured. The properties which were considered are: (1) Thermal expansion—because of rapid temperature changes to which saggers may be subjected during service it is desirable they should have a low expansion; (2) elastic properties—because the greater the rigidity the more difficult for the material to adjust itself to rapid thermal volume changes to which it may be subjected; (3) plastic flow at high temperatures—because if a sagger is heavily loaded, the bottom must resist a tendency to bulge and crack.

MEASUREMENT OF MOISTURE EXPANSION OF WHITEWARE

Twelve specimens of ceramic whiteware were stored for 1 year in closed containers over water and their moisture expansion determined by direct and indirect methods. The values, by direct measurement, ranged from 0 to 0.14 percent and did not vary in any case by more than 0.02 percent from the values by indirect measurement. This duplicates the conclusion reached with autoclaved specimens (Technical News Bulletin No. 184; August 1932) that results by the two methods agree within the precision of the direct measurements.

STRESSES IN ENAMELS

Examination of the coefficients of thermal expansion of enamels and the metals to which they are applied, below the critical temperatures of the enamels, does not yield a comprehensive picture of the stresses created in enamel coatings as they cool subsequent to fusion upon the metal at red heat. The effects upon such stresses which are produced by (1) the rapid change in expansivity of an enamel which occurs at its critical temperature; (2) variations in the rate of cooling of the enamel, and in the differential cooling rate between the enamel and the iron; (3) variations in the enamel composition to produce changes in critical and softening temperatures; and (4) variations in the thermal expansivity of enamels, are all being studied by an adaptation of the Schurecht ring test, originally applied to glazed ceramic bodies. The application of this method has been extended, however, to include observations of the strain-temperature relationship throughout rapid and slow heating and cooling cycles. To this end the changes in width of a slot cut through a ring-shaped band of iron with enamel applied to one side, are observed during the temperature cycles by means of a telescope. Thus, the movements of a ring toward and away from its unstressed position, which are brought about by differential expansion or contraction between the enamel and the iron, can be closely followed and quantitatively measured. Simultaneously, temperature measurements are made by means of thermocouples spot welded to the iron under the enamel. Since the expansion curves of the enamels, plotted against temperature, are known from previous determinations, it is possible to correlate the stress changes with given phases in the expansional or contractional paths of the enamels.

DETERMINATION OF THE SPECIFIC SURFACE OF PORTLAND CEMENT

The inadequacy of sieves for measuring the fineness of portland cement has long been recognized. Several methods have been developed for determining subsieve-particle sizes, but there is still urgent need for a rapid method suitable for use in industrial control laboratories.

An apparatus and method have been developed at the Bureau by means of which rapid determinations of the size distribution and the specific surface of cement can be made. The apparatus, which is essentially a turbidimeter, consists of a source of light of constant intensity which passes through a suspension of the cement in kerosene and into a photo-electric cell. The current generated in the photo-electric cell is measured with a microammeter. The readings afford a measure of the turbidity of the suspensions and the relation between the turbidity and the surface of the suspended particles may be calculated. Particle-size distribution is obtained by observing changes in turbidity as the particles settle from the suspension.

The time required to test a sample is about one half hour. For routine work on cement from the same source the time for a single test can be reduced to 10 minutes.

It is believed that the device and method may be adapted to determining the fineness of other finely ground materials.

VISCOSITY OF OPTICAL GLASS

Research Paper No. 577 in the July number of the Bureau of Standards Journal of Research is a report of an investigation of the viscosities, at high temperatures, of six optical glasses—light barium crown, borosilicate crown, soda-lime, and dense, medium, and barium flint glasses. A concentric-cylinder type viscometer, an electrically heated furnace, and porcelain stirrers and crucibles were used. For a limited number of tests the porcelain was protected with platinum.

The driving torque was produced by masses of known weight, and the time required per revolution was measured with a stop watch automatically started and stopped. Temperatures were determined by means of four platinum to platinum rhodium thermocouples.

Preliminary to work on glass, determinations were made of friction corrections; and certain factors, including the so-called "end effect", were evaluated. The method of producing and testing constancy of rotational speed is described. The classical equation for viscosity, when using an ideal concentric cylinder viscometer, was modified to fit the apparatus used. The paper sets forth methods for the derivation and correction of the miscellaneous factors involved.

Viscosity values were determined for each glass in the temperature range 900° to 1,400° C. (1,652° to 2,552° F.), and equations are given expressing the mathematical relations of viscosity to temperature. A brief discussion of the viscosity changes resulting from volatilization of the glass and its reaction with the crucibles and stirrers, and of the consequent difficulty in determining the exact composition of a glass at the time the test is made, is included.

EXTRACTION OF LEVULOSE FROM JERUSALEM ARTICHOKES

During the past 12 months important progress has been made in the Bureau's investigation of the recovery of levulose from jerusalem artichokes on a semicommercial scale. This is the first year in which the artichoke juices were extracted solely by means of the battery, and the first year that the new and larger battery was employed. The results have demonstrated anew that diffusion juice is far superior to pressed juice as material from which to recover levulose.

Battery extraction.—A total of about 50 short tons of jerusalem artichokes was worked, of which about 8½ tons came from Mississippi and the rest from the local field at Beltsville, Md., and Arlington, Va. The tubers from Beltsville were by far the best, both as to size and the percentage of sugar contained. It was found perfectly feasible to extract 97 to 98 percent of the 14 to 16 percent of reducing sugars which these artichokes contained, and to produce at the same time a diffusion juice which had a density of 14 to 15 brix. Very little trouble was encountered with the washing of the artichokes, except that certain parts of the machine are nearly worn out and tend to fail at crucial moments. The washer, which was designed and developed by the Bureau, still washes very thoroughly, and when properly adjusted, allows no stones to pass. Small roots and other fibrous parts which were attached to the artichokes, and hence were not removed by the washer, gave a great deal of trouble. They clogged the knives of the small drum slicer and caused the cossettes to be mushy and resistant to the passage of the water and juices in the battery. Otherwise the small slicer functioned very satisfactorily and produced the best grade of chips obtained from artichokes. Owing to the relatively small size of even the largest tubers, however, the artichoke chips cannot compare with good beet chips as material for extraction in a diffusion battery.

Precipitation.—The precipitation experiments were very successful on the whole. Most of the levulate precipitate was filtered on the automatic rotary drum vacuum filters. It seemed impossible to apply sufficient wash water to displace the mother liquor in the cake when the most free-filtering precipitates were obtained. Higher purities were obtained when, owing to the poor quality of the juice, very unsatisfactory precipitates were being produced; that is, when the rate of filtration was small enough to allow adequate washing. The gain in purity may have resulted only partly from the better washing; but at least the results indicate that a clean precipitation is not necessary for the production of good purities—which is contrary to the Bureau's previous assumptions. The last two precipitations of this year's artichoke juices were filtered on the vacuum leaf filter, which has about 11 times the combined filtering area of the two automatic rotary drum vacuum filters used for levulate filtration. This was done partly to speed the work, but mainly to study the effect of more extensive washing and to observe the behavior of the material on this type of filter. The residues were filtered on a plate and frame filter press which was used exclusively in some of the Bureau's early work several years ago. Thus, there has been obtained certain comparative results with three types of filter on this year's juices. This year, as the result of improvements in the mechanical equipment, it has been found feasible to precipitate more concentrated solutions than had previously been considered practical. The indications are that the losses in waste water are not proportionately higher.

General results.—Probably the greatest improvements in this year's run, compared with the runs of previous years, can be attributed to the use of diffusion juice exclusively in-

stead of incidentally; to improve technique in the hydrolysis, or "conversion" of the polysacharides, a result which was made possible by improvements in the mechanical equipment; to the use of lime of much better quality both physically and chemically; to improvements in the equipment for carbonation; and especially to improve methods of treatment immediately following carbonation. There have been discovered the sources of several systematic mechanical losses in the processing, which, though suspected, had been previously unexplained or not demonstrated.

A number of problems remain to be solved in the practice of the levulate precipitation and carbonation, but in the main this part of the process seems to be in a fairly satisfactory state of development. A considerable part of this development has been accomplished during the last year.

IMPROVEMENT OF SULPHITE BOND PAPERS

The Bureau recently completed paper-making experiments on sulphite bond paper, and as a result more definite information is now available on the relation between the degree of purity of fibers and the stability of such paper. The proper steps to be taken to obtain maximum quality in paper made from this type of fiber have likewise been determined.

Forty-three papers were made to find the effects of various modifications in the beating and sizing operations. Beating is a mechanical operation in which fibers are subjected to a cutting and bruising action in the presence of water to improve their felting properties, develop strength, and otherwise render them suitable for handling on the paper machine. The method and duration of beating differ with each kind of fiber. The sulphite fibers were found to require less beating to develop optimum strength than many fibers of higher purity. For this reason they were somewhat more susceptible to overbeating which results in hard, "tinny", transparent papers. A procedure was developed for producing moderately high-strength papers with well-balanced physical characteristics. Under accelerated aging conditions the stability of the sulphite papers, as measured by the percentage change in strength, decreased progressively with beating. Beating, however, did not alter the chemical properties of the papers to any significant extent. Such desirable properties in bond papers as tearing strength and opacity decreased with beating, while folding endurance and tensile properties increased. The beating conditions, therefore, were so chosen as to give the best balance between all the desired properties.

Sizing materials are added to bond papers to obtain the required writing quality and other properties. Rosin and alum (an acid salt) and sometimes starch are incorporated in the paper stock. In addition, higher-grade papers are surface sized by passing them through a bath of glue or starch containing some alum. As was the case with other types of fibrous raw materials studied, the amount of alum used had to be controlled very carefully to obtain optimum writing quality and stability. With the minimum amount of alum required for satisfactory writing quality, the stability of the papers, as judged by the heat test, was practically as good as that of the unsized papers. Unlike papers that were previously made from purer and stronger fibers, the sulphite papers containing rosin were more stable than the papers of corresponding acidity containing no rosin. Starch incorporated in the paper stock increased the folding endurance and tensile properties somewhat, but had no measurable effect on the tearing strength and stability.

Surface sizing with glue or starch had little or no effect on the stability of the papers, but improved the tensile properties and lowered the tearing strength. Surface sizing did not greatly improve the folding endurance.

Apparently no general rule holds good for different types of papers as regards effect of sizing materials on their strength and stability, except that too much acidity from alum invariably causes the paper to be unstable. The relatively low stability of many commercial sulphite bond papers is caused by their unnecessarily high acidity. This study has shown that measurable improvement would result if the amount of alum were limited to that necessary for adequate writing quality.

The results of this study, which will be reported in full in Research Paper No. 574 in the July number of the Bureau of Standards Journal of Research, are further evidence of the close relation between the purity of paper fibers and the stability of paper. The moderate resistance to deterioration of the best papers produced, as judged by the heat test, was commensurate with the medium degree of fiber purity.

EFFECT OF ATMOSPHERIC MOISTURE ON LEATHER

Moisture always present in the atmosphere markedly affects the properties of leather. At the Bureau a study has been made of the way leather reacts to changes in humidity. Samples of chrome and vegetable-tanned calf leathers were conditioned at a definite relative humidity over saturated salt solutions and were subjected to various physical tests to determine the effects of the adsorbed water. It was found that, due to an increase in the humidity of the atmosphere surrounding it, a piece of leather might increase as much as 12 percent in area, 60 percent in tensile strength, and 100 percent in breaking load. The samples of chrome-tanned leather showed changes of greater magnitude than the vegetable-tanned leather. This is explained by the greater amount of protein material in the former. The mechanism of the effect of adsorbed water on the strength of leather was also studied.

For a complete account of this work, Research Paper No. 583 in the Bureau of Standards Journal of Research for July, should be consulted.

PERMISSIBLE CURVATURE OF PRISM SURFACES AND INACCURACY OF COLLIMATION IN REFRACTOMETRY

The supposed necessity for using very flat prism surfaces and a perfectly parallel beam of light when making accurate measurements on the index of refraction of optical glass has been investigated recently in the optical instruments section at the Bureau.

This study included: (1) Determination of the degree of precision of translational adjustment that is necessary when measuring prisms of the best quality which have angles and refractivities the most unfavorable that must be handled; (2) the devising of simple and convenient means for attaining the desired precision of translation; and (3) investigation of the effects of eccentricity of the prism-table axis of the spectrometer.

Research Paper No. 575, which will be published in the July number of the Bureau of Standards Journal of Research, sets forth the conclusions reached as a result of this work, which may be summarized as follows: For refractive-index measurements on 60° prisms of all the usual optical glasses, the prism surfaces may depart appreciably from flatness, provided the surface of a given prism are both convex or both concave. This tolerance in quality of prism surfaces greatly facilitates the making of glass prisms for measurements of this kind. The beam of incident light may be used when slightly convergent or divergent, and this latitude permits a more rapid observational procedure which eliminates the customary and troublesome collimation adjustments of the spectrometer.

IMPROVED CHAIN-PACKED DISTILLING COLUMN

An automatically controlled chain-packed distilling column, designed in the chemistry division of the Bureau for use in its investigations of the properties of petroleum, is described in Research Paper No. 579 in the July number of the Bureau of Standards Journal of Research. Its performance is indicated by showing the degree to which benzene and ethylene chloride, which boil 3.42° C. apart, can be separated in a single operation. From a mixture containing 50 mole percent each of benzene and ethylene chloride, both constituents may be obtained in a substantially pure condition. The still is small enough to be installed in a laboratory of ordinary height.

INTERNATIONAL COMPARISON OF TEMPERATURE SCALES

The adoption of the International Temperature Scale in 1927 by 33 nations has provided a common basis for the expression of temperature. This basis consists of definite numbers assigned to the freezing points and boiling points under standard atmospheric conditions, of a number of pure substances. The degree of accuracy to which any given laboratory realizes this scale in practice depends obviously on the purity of the substances used and may depend on the experimental procedure followed.

In order to compare the working scales of the national standardizing laboratories of the United States, Great Britain, and Germany, each of these laboratories furnished 2 standard platinum-rhodium thermocouples, or 6 in all, which were calibrated in the range 660° to 1,063° C. by each of the laboratories in turn. These calibrations checked to 0.1° C. except at the freezing point of silver, 960.5° C., where differences of as much as 0.5° C. occurred. These differences were found to result from differences in the purity of the silver. Two of the laboratories replaced the silver used as a temperature standard with metal of higher purity. When this was done, the differences at the silver point were eliminated.

Work is now in progress to carry out similar intercomparison both above and below the range covered in the present work.

The official report of this investigation will be published as Research Paper No. 573 in the July number of the Bureau of Standards Journal of Research.

EQUIPMENT FOR TESTING CURRENT TRANSFORMERS

When measuring the electrical energy used in a private house the entire current can be passed directly through the meter. In the case of the much larger amounts of energy supplied to factories, power substations, etc., this procedure is not feasible, and it becomes necessary to use a set of instrument transformers which supply to the meter proper a current reproducing exactly on a reduced scale the currents flowing in the power circuits. Obviously an error of, say 1 percent, in the scale reduction or "ratio" of such a transformer will produce an error of 1 percent in the monthly power bill, which in many cases may correspond to many thousands of dollars. In order that the ratio of such transformers may be correctly allowed for, they must be carefully tested under conditions which duplicate as closely as possible those under which they are to be used.

The Bureau will publish as Research Paper No. 580 in the July number of its Journal of Research a detailed description of the equipment and methods which it has developed during the past 20 years for making tests of this kind with the highest accuracy, up to currents of 12,000 amperes. This description should be a useful guide to workers in the standardizing laboratories of the large power companies and manufacturers who are called upon to make similar tests, and should also serve to give the metermen who send their transformers to Washington for test a more definite picture of just what procedure is applied to their apparatus.

200-KILOCYCLE PIEZO OSCILLATOR

Research Paper No. 576, which will appear in the July number of the Bureau of Standards Journal of Research, describes a piezo oscillator which is used to control the frequency of the standard frequency transmitter of the Bureau.

The piezoelectric element is a Curie or zero-cut quartz plate having a fundamental frequency of 200 kilocycles per second. The mounting is a clamped type which maintains the quartz plate in a fixed position between the electrodes without introducing an excessive amount of damping.

The oscillator circuit arrangement is of the conventional type in which the quartz plate is connected between the grid and filament of a UX112A tube. An untuned inductance load is connected in the plate circuit. There are two coupling amplifiers which are connected in cascade. The first is a UX222 tube which is connected to the oscillator plate impedance through a small condenser and a voltage divider arrangement. The second amplifier is a UX112A tube.

The temperature control consists of two thermostatically controlled compartments, one within the other. The quartz plate has a double temperature control while the oscillator and amplifier circuit arrangements are within the outer control only.

The piezo oscillator described has been in use for a year. During this time its frequency in terms of the primary frequency standard has changed less than 1.5 parts in 10^9. The frequency is constant within a few parts in 10^8 for several hours.

CONFERENCE OF STATE UTILITY COMMISSION ENGINEERS

The Eleventh Annual Conference of State Utility Commission Engineers was held at the Bureau on June 1–3, 1933, inclusive. Twenty-four engineers, representing 12 States, the District of Columbia, and the Province of Ontario, Canada, were present.

The following papers and written discussions were presented:

1. The grounding of electric circuits, A. G. Mott, Railroad Commission, San Francisco, Calif.; discussion by M. G. Lloyd, Bureau of Standards, Washington, D.C.
2. Limitations of voltages in joint use of poles, J. K. Pettengill, Public Service Commission, Lansing, Mich.; discussion by P. L. Holland, Public Service Commission, Baltimore, Md.
3. Contacts of the Airways Division, Department of Commerce, with public-utility companies, F. C. Hingsburg, Airways Division, Bureau of Lighthouses, Department of Commerce, Washington, D.C.
4. Grade-crossing classification and protection, E. I. Rudd, Public Utilities Commission, Hartford, Conn.; discussion by J. G. Hunter, Railroad Commission, San Francisco, Calif.

5. Determination of billing demand, C. B. Hayden, Public Service Commission, Madison, Wis.
6. Transportation by motor vehicle:
   Rules and regulations for transportation by bus, H. C. Eddy, Board of Public Utility Commissioners, Newark, N.J.
   Truck and bus regulations, J. Houston Johnston, Public Service Commission, Atlanta, Ga.
   The open road, R. H. Nexsen, Public Service Commission, New York, N.Y.
   Taxicab regulations, F. A. Sager, Public Utilities Commission, Washington, D.C.
   Discussions by P. L. Holland, Public Service Commission, Baltimore, Md., and J. P. Wadhams, Public Utilities Commission, Hartford, Conn.
7. Line extension policies, Harry Barker, Public Service Commission, Montpelier, Vt.; discussion by Philander Betts, Board of Public Utility Commissioners, Newark, N.J.
8. Relation of underground corrosion data to pipe-line economies, K. H. Logan, Bureau of Standards, Washington, D.C.; discussion by T. R. Tate, Public Utilities Commission, Washington, D.C.
9. Maximum-demand meter approvals, R. H. Nexsen, Public Service Commission, New York, N.Y.; discussion by William Black, Public Service Commission, Harrisburg, Pa.

Copies of the papers and discussions are obtainable only from the authors, to whom application should be made.

An executive committee to prepare for next year's conference was elected as follows: R. H. Nexsen (N.Y.), chairman; Harry Barker (Vt.), J. N. Wiley (N.Dak.), P. L. Holland (Md.), J. C. Boyer (Va.), J. Franklin Meyer, secretary (Bureau of Standards, Washington, D.C.).

VIRTUAL HEIGHTS OF THE IONOSPHERE

Research Paper No. 582 in the July number of the Bureau of Standards Journal of Research describes continuous measurements by the Bureau of the virtual heights of the ionized regions of the upper atmosphere. A radio transmitter working on a frequency of 4,100 kilocycles per second is caused to send out short pulses of radio-frequency energy. A receiving set in the same room receives each pulse directly and by one or more paths through the upper atmosphere. An oscillograph records photographically the time required for the pulse to go up and be reflected back to earth again. The records give a continuous and direct measure of the virtual heights at which the pulses are reflected at any time.

On this frequency, during the winter months, reflections come from the F region with heights varying between 240 and 320 km in the daytime. Just after sunrise and before sunset the height is around 240 km, but during the middle of the day the reflection often splits into two components and the 240-km reflection becomes weak and disappears. The remaining component may rise during the middle of the day to 300 or 320 km and then drop gradually to join the 240-km component which reappears before sunset.

At sunset in the winter the heights increase rapidly on some days and gradually on others until they reach 500 or 600 km where reflections are usually weak and frequently disappear entirely. Occasionally they will continue throughout the night with heights not greater than 500 km. Of greatest interest is the reappearance of reflections at night which may come in very suddenly and remain from a few minutes to several hours. These reflections sometimes come from the E region with a height of about 120 km or from the F region showing a virtual height of between 280 and 600 km. An increase in ionization is probably responsible for the reappearance of E deflections of the type shown. However, F reflections which gradually become strong at night may possibly be explained by recombination of ions in the lower part of the F region which exposes a more strongly ionized upper part.

Rapid changes in virtual height are most frequently noted at sunrise and sunset, although such changes may occur at other times when this frequency is near a critical value. A drop in virtual height at the rate of more than 1 km for 90 seconds or more is often observed.

It is pointed out that the changes observed are so abrupt and irregular that data taken over a longer period and for other frequencies will be necessary before it is possible to establish the relative importance of such things as magnetic storms, meteor showers, sun spots, or thunderstorms.

IMPROVED ANTENNA SYSTEM FOR RADIO BEACONS

In the radio range-beacons located along the airways of the United States the course indication is secured by the intersection of two space patterns produced by properly excited antenna structures. In the TL antenna system recently developed by the Bureau of Standards for these stations to eliminate night effect, four towers are employed to secure the desired space pattern. In order that this pattern may remain fixed in space the relations between the currents in the various structures must be maintained constant, both as to phase and magnitude, to a high degree of accuracy.

To accomplish this the Bureau has developed an excitation system which automatically maintains this relationship even during adverse conditions of antenna tuning. This synchronizing action is secured in one of two ways, first by the use of transmission lines 90 electrical degrees in length connected in parallel to the power amplifiers, and second by lines 180° long connected in series.

The operation of the parallel connected lines is dependent upon the fact that the relation between sending voltage and receiving end current for a line 90° in length is independent of the impedance of the load. The series connection is based upon the condition that a 180° line acts as a simple series circuit and consequently the current is continuous throughout the system. Both of these are dependent upon the fact that the attenuation of the line is negligible.

Tests of the system show it to perform very satisfactorily and it has been adopted as the standard method of installation on the airways. A complete description of this development will appear as Research Paper No. 581 in the July number of the Bureau of Standards Journal of Research.

DETONATION RATING FOR AVIATION FUELS

The following is an abstract of a paper prepared by H. K. Cummings, chief of the automotive power plants section of the Bureau of Standards, for presentation at the World Petroleum Congress which is being held in London this month.

The American Society for Testing Materials' tentative method of test for knock characteristics of motor fuels (method D 357-33T) was developed as a result of intensive research by the automotive industry, the petroleum industry, and the Bureau of Standards, coordinated by the Cooperative Fuel Research Steering Committee. In February 1933 this committee became sponsor for an investigation to be conducted jointly by the aircraft-engine manufacturers, the gasoline producers, and those Government agencies concerned with the quality of aviation fuel. The object of this investigation is to develop a standard method for the detonation rating of aviation fuels which will be applicable to all varieties of fuels and to all types of spark-ignition aircraft engines.

At present each type of aircraft engine is specified as requiring fuel of at least a certain octane-number rating. The majority of military aircraft engines require fuel rated above 80 octane number but many commercial aircraft engines are approved for use on fuels of 73 octane number and some aircraft engines give satisfactory performance on fuels of less than 60 octane number. The Army, the Navy, and the Department of Commerce all use different methods of determining the octane number of an aviation gasoline, and several other methods are used by commercial laboratories. Since ratings by all methods are made by comparing the fuel under test with blends of the same two hydrocarbons (normal heptane and iso-octane), many fuels are rated nearly the same under all test conditions but certain types of fuel (benzol-gasoline blends, for example) are rated lower when the test conditions are made more severe, while other types of fuel are rated higher under high-temperature test conditions. Blended fuels of these three types are to be matched against reference fuels of 73, 80, and 87 octane number in a variety of multi-cylinder aircraft engines, by four engine manufacturers and the Bureau. The results of these engine tests will show whether the present standard method of rating motor fuels correctly evaluates fuels in terms of their average aircraft-engine performance.

The Bureau rates aviation as well as motor fuels by A.S.T.M. method D357-33T and the temporary use of this method for determining the octane-number ratings of commercial aviation gasolines has been recommended to the aircraft industry by the Aeronautical Chamber of Commerce, pending the development of a standard aviation method.

DISCONTINUANCE OF MONTHLY ANNOUNCEMENTS OF NEW PUBLICATIONS

For several years the Bureau has issued a monthly leaflet listing new publications in its series. Because of the limited funds available for printing, this leaflet was discontinued with the June 1933 number, Announcement No. 96. Practically the same material will be available in the Technical News Bulletin which contains abstracts of most of the Bureau's publications and also lists by title all papers by members of the staff in the Bureau's series and in outside journals. All those who have been receiving the monthly announcements are urged to subscribe to the Technical News Bulletin.

DISCONTINUANCE OF COMMERCIAL STANDARDS MONTHLY

The Commercial Standards Monthly was discontinued with the June 1933 number, which completed vol. 9. Reduction in the Bureau's funds available for printing have made this necessary.

NEW AND REVISED PUBLICATIONS ISSUED DURING JUNE 1933

Journal of Research [1]

Bureau of Standards Journal of Research, vol. 9 (RP nos. 453 to 511, inclusive), bound in cloth, $3 ($3.50 foreign).

Bureau of Standards Journal of Research, vol. 10, no. 6, June 1933 (RP nos. 561 to 572, inclusive). Price 25 cents. Obtainable by subscription.

Research Papers [1]

(Reprints from Journal of Research)

RP533. Determination of aluminum in nitriding steels by the use of 8-hydroxyquinoline; H. A. Bright and R. M. Fowler. Price 5 cents.

RP534. The oxidation of alpha and beta glucose and a study of the isomeric forms of the sugar in solutions; H. S. Isbell and W. Pigman. Price 5 cents.

RP538. The vapor pressure of liquid and solid carbon dioxide; C. H. Myers and M. S. Van Dusen. Price 5 cents.

RP539. Methods for determining the total acidity of soils; J. A. Denison. Price 5 cents.

RP540. Infra-red spectra of neon, argon, and krypton; W. F. Meggers and C. J. Humphreys. Price 5 cents.

RP541. Photographic reversal by desensitizing dyes; B. H. Carroll and C. M. Kretchman. Price 5 cents.

RP542. 1, 1-dimethylcyclopentane and 2-methylhexane in a midcontinent petroleum; J. H. Bruun and M. M. Hicks-Bruun. Price 5 cents.

RP543. The combination of silk and wool with positive and negative ions; M. Harris. Price 5 cents.

RP544. The preparation and crystallization of pure ether-soluble rubber hydrocarbon: Composition, melting point, and optical properties; W. H. Smith, C. P. Saylor, and H. J. Wing. Price 5 cents.

RP545. Wind pressure on a model of the Empire State Building; H. L. Dryden and G. C. Hill. Price 5 cents.

RP546. Standard states for bomb calorimetry; E. W. Washburn. Price 5 cents.

RP547. The influence of pH on the deterioration of vegetable-tanned leather by sulphuric acid; R. C. Bowker and E. L. Wallace. Price 5 cents.

RP548. An apparatus for magnetic testing at high magnetizing forces; R. L. Sanford and E. G. Bennett. Price 5 cents.

Technical News Bulletin [1]

Technical News Bulletin No. 194, June 1933. Price 5 cents. Obtainable by subscription.

LETTER CIRCULARS

It is the intent of the Bureau to distribute single copies of these mimeographed letter circulars on request only to those parties having a special interest in the individual letter circular. Economy necessitates limitation in the number of copies issued. It is not the intent to supply parties with a copy of each letter circular issued during the month. Letter circulars are necessarily of a temporary nature designed to answer numerous inquiries on a given subject. Requests should be addressed to the Bureau of Standards, Washington, D.C.

LC381. Suggested information on reconditioning home interiors—furniture and built-in equipment.

[1] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D.C. Subscription to Technical News Bulletin, 50 cents per year (United States and its possessions, Canada, Cuba, Mexico, Newfoundland, and Republic of Panama); other countries, 70 cents. Subscription to Journal of Research, $2.50 per year; other countries $3.25.

LC382. Comparisons of residential vacancy survey reports in 51 towns and cities.
LC383. Practical reasons for modernizing old homes.
LC384. Publications relating to electric batteries (supersedes LC162).
LC385. Home modernizing activities and financial plans, as described by local business leaders.
LC386. Suggested specification for cold-water paint.

OUTSIDE PUBLICATIONS [2]

Steel, Sydney, A theory of fuel-knock, Nature (London, England), vol. 131, p. 724; May 20, 1933.

[2] "Outside publications" are not for distribution or sale by the Government. Requests should be sent direct to publishers.

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